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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : G11B 7/24, 17/04	A1	(11) International Publication Number: WO 98/38637 (43) International Publication Date: 3 September 1998 (03.09.98)
(21) International Application Number: PCT/US98/03844 (22) International Filing Date: 27 February 1998 (27.02.98) (30) Priority Data: 08/808,348 28 February 1997 (28.02.97) US (71) Applicant: WEA MANUFACTURING, INC. [US/US]; 1444 East Lackawanna Avenue, P.O. Box 321, Olyphant, PA 18447 (US). (72) Inventor: SEIDEL, Robert, T.; 708 Wyoming Avenue, West Pittston, PA 18643 (US). (74) Agent: RUBENSTEIN, Allen, I.; Gottlieb, Rackman & Reis- man, P.C., 8th floor, 270 Madison Avenue, New York, NY 10016 (US).	(81) Designated States: AU, CN, JP, SG, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>	
(54) Title: TWO-SIDED HYBRID DVD-CD DISC <div> </div>		
(57) Abstract A two-sided optical disc which has the same content in two different formats readable from the two sides of the disc. The disc is formed by bonding two data bearing surfaces (7, 27) together so that their metallization surfaces (9, 29) are held together by a bonding agent (41).		

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TWO SIDED HYBRID DVD-CD DISC**FIELD OF THE INVENTION**

This invention relates to compact discs for
5 optically storing primarily digital data in a series of
pits and lands on a plastic surface. In particular the
invention relates to data storage in both standard audio
CD format and in a super-dense (DVD) format on the same
structure.

BACKGROUND OF THE INVENTION

Compact discs are record carriers for digital or
analog information, for example audio and/or video infor-
mation, which have the form of a flat disc-shaped plastic
15 surface on which a data modulated optical structure is
provided in accordance with the information. The data is
formed as pits of varying length present in the surface
and arranged in a spiral path. The pits have nanometer
dimensions and are formed by injection molding against a
20 mold having corresponding raised regions. The informa-
tion stored on the compact disc is recovered in a reader,
usually called a player, which rotates the compact disc
and guides a laser device along the spiral track as the
compact disc rotates. The presence or absence of pits
25 under the laser is detected as a change in the luminance
returned from the surface directly below the laser. In
this manner the length of the pits is detected and
decoded as data.

The critical dimensions of the recorded pits on the glass master are of the order of magnitude of the wavelength of visible light used to read the data. Advances in technology have resulted in a new format of disc, termed the DVD disc, that utilizes substantially smaller pit dimensions and accordingly is read using light having a proportionally shorter wavelength. One feature of the new DVD format is that the plastic surface formed by injection molding in which the data is recorded is roughly half the thickness of the previous (now conventional) CD disc. In order to provide rigidity to the "half height" DVD data surface it is normally backed with a plastic layer of equal "half height" thickness.

Thus there has resulted compact discs having different data formats and needing to be played on different players as an inevitable result of the striving to improve disc data storage. This inevitably creates problems for the distributor and the customer who must be burdened with having to be aware of inventories of varying disc formats. To effectuate a transition it is desirable to provide a single disc that could be played on different players designed for the different disc formats.

BRIEF DESCRIPTION OF THE INVENTION

This invention is a single disc, playable in either a CD or DVD player, which has bonded back-to-back a half height standard format compact disc metalized substrate

and a metalized DVD substrate, resulting in a two-sided hybrid DVD-CD disc. Each side can be played in its corresponding player. The format for the CD side is preferably any of the conventional Sony/Philips formats, including but not limited to CD-Audio, CD-ROM, CD-I, CD+G, CD-ROM XA, CD-PLUS and CD-VIDEO. The disc format for the DVD side can be any of the DVD formats, including without limitation DVD-VIDEO, DVD-ROM, and DVD-Audio.

The format allows content developers to market a single disc that users can play on either a CD or DVD player.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a cross section of a portion of a prior art full height CD format compact disc.

Fig. 2 shows a cross section of a portion of a prior art full height DVD format compact disc.

Fig. 3 shows a cross section of a portion of a half height CD formatted compact disc component.

Fig. 4 shows a cross section a portion of a hybrid compact disc of the present invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

The disc of the present invention has two data surfaces whose metallization layers face each other along an inner surface of the disc and are held together by a bonding agent. This is depicted as the compact disc 1 in Fig. 4. To make this clearer, Fig.1 depicts a conven-

tional (i.e. prior art) full height CD 1. This comprises a plastic data recording layer 3 with a flat upper surface 5 through which the irregular data recording surface 7 is viewable by a scanning laser 9. To increase the reflectivity of the data of layer 7 a metallization layer 9 is deposited. A layer 11, which does not need to be transparent is then deposited on the metallization layer 9 to protect the latter and to provide the full height of the disc. The figure is, of course, not shown to scale, but is intended to schematically represent a disc of full height.

Fig. 2 depicts the DVD disc of the prior art. It is shown inverted with respect to Fig. 1 so that the laser views the data surface from below. The half height disc 13 is bonded by adhesive to a supporting half height disc 15. More specifically, the data surface is overcoated by a metallization layer 29, which is in turn overcoated by a protective layer 31 to which is adhered the supporting disc 15, making up the full height of the disc.

Fig. 3 shows a half height disc in the CD format, made by reducing the thickness of the protecting layer 41 corresponding to the supporting layer 11 of Fig. 1. The data containing layer 3 is intended to have the same thickness as the layer depicted in the prior art of Fig. 1, and the pit size in Fig. 3 and Fig. 1 are intended to be the same.

Fig. 4 depicts a preferred embodiment of the present invention in which two half height discs such as the half

height CD format depicted in Fig.3 and the lower half height composite of layers depicted as 13 in Fig. 2 are bonded together. The result is that the two metallization layers 29 and 9 face each other, and each of the two data surfaces 7 and 27 are viewable by a laser directed from above in the case of the CD and from below in the case of the DVD. Of course, these orientations are relative, and for players where the laser is directed upwards from below, the DVD formatted surface is readable as described and the CD formatted surface is readable by inverting the disc.

A label area may be provided on each disc away from the data areas so as to not interfere with the readable surfaces. It should also be understood that as an alternative to providing protective layers on the facing sides of the metallization layers, which are then bonded together, it is possible to use an adhesive that also provides a protective function for either or both of the two metallization layers, provided that the height of the resulting disc composite is maintained.

Alternatively, it is possible to place labels on the disc by replacing the metallization layers with a dielectric layer that is reflective of the laser frequency used to read the data and is transmissive of a broad portion of the visible optical spectrum.

In this application, spectral tuning the thin film dielectric coating occurs by designing a dielectric thin film coating with a reflectivity equal to the metallic

reflectivity at the playback wavelength of the optical reading system. At the same time, the coating transmits 99% of the entire visible spectrum of wavelengths. An optical index matching balsam is added to improve reflectivity performance.

The described thin film dielectric coating permits the viewing of graphical information while maintaining full playability/readability of the encoded optical substrate information. In this embodiment logos and other information may be placed at the position indicated in Fig. 4 for the adhesive layer 41. The additional layers are layers of ink and are not separately depicted in the figures.

A unique feature of this invention is the combination of two distinct optical disc formats into one rigid disc. In operation a consumer has a disc which is capable of playing on both CD and DVD players. This allows content developers to have the ability to market their property to both the CD and DVD player consumer using one disc, rather than distributing one disc for CD customers and another disc for DVD customers.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to preferred embodiments thereof, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the in-

vention. It is the intention, therefore, to be limited only as indicated by the scope of the claims appended hereto.

What is claimed is:

1. A compact disc having optical data recorded on both sides thereof in two distinct formats, comprising

5 first and second half height compact disc surfaces having data recorded therein in a first and second data format, respectively,

an adhesive layer bonding together said first and second half height compact disc surfaces to form a compact disc of full height,

10 wherein, said disc is playable in a player for either said first format or, by flipping said compact disc, playable in its second format.

2. The compact disc of claim 1, wherein substantially
15 the same data is recorded in said first and second half height discs in said respective data formats.

3. The compact disc of claim 1, wherein said data
surfaces have labels viewable through the data layers of
20 said compact disc surfaces.

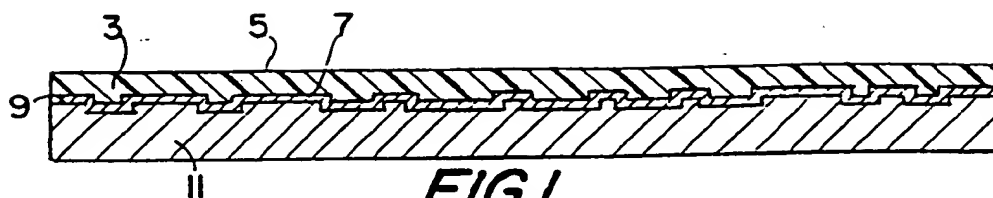


FIG. 1
PRIOR ART

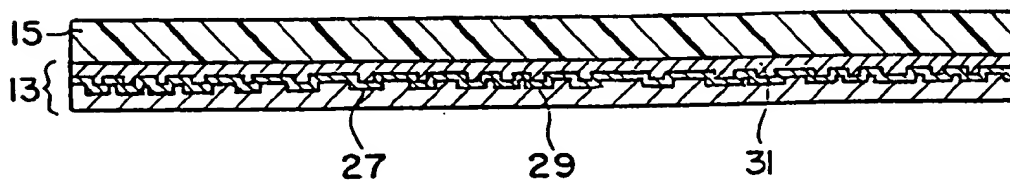


FIG. 2
PRIOR ART

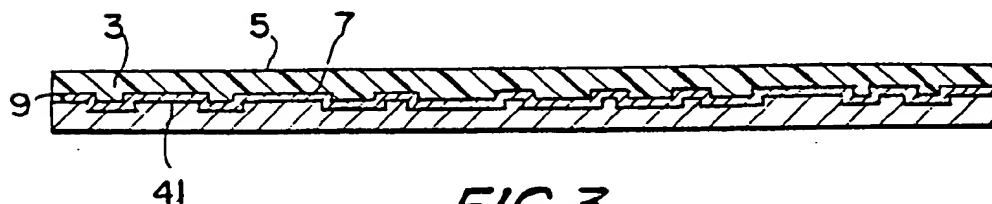


FIG. 3

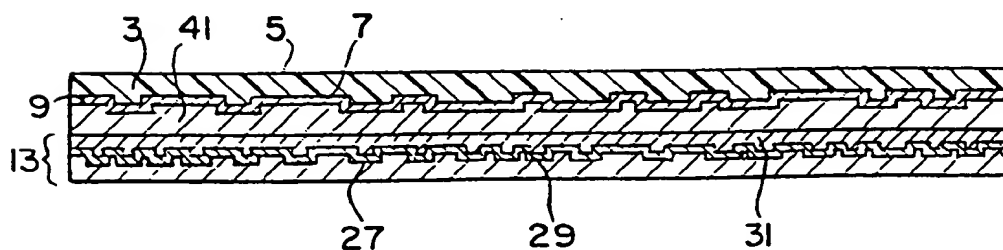


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/03844

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : G11B 7/24, 17/04
US CL : 369/275.1, 275.2, 275.3, 275.4, 275.5, 196, 199, 288, 286
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 369/275.1, 275.2, 275.3, 275.4, 275.5, 196, 199, 288, 286

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS
searched item: double(Sa)sided(P)(disk or disc or medium)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,706,269 A (OGURA et al) 06 January 1998, see fig 1(b).	1-2
A	US 5,518,325 A (KAHLE) 21 MAY 1996, see fig 1.	1-3

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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Date of the actual completion of the international search

14 APRIL 1998

Date of mailing of the international search report

19 JUN 1998

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